HEART ATTACK

By

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PREFACE

The Trustees of the Sulakhani Devi Mahajan Trust are grateful to Major General B.N. Bhandari, Chairman, Charitable Medical Clinic, Ljapat Bhawan, New Delhi for his kindness in writing this book on a subject which has and is assuming great importance in modern times. Shri Bhandari is a noble man who has the good of society in heart and is always willing to help all those who are suffering from any ailment. He has a sympathetic heart and takes great pains in the welfare of all those who visit his above-mentioned clinic. His devotion to his work is praise-worthy. We pray to God that he lives long to serve humanity.

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VIDYA DHAR MAHAJAN
Chairman
Sulakhani Devi Mahajan Trust

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CHAPTER I
ANGINA

We all feel most concerned if we get pain in the chest, especially over the region of the heart. Any irregularity of the pulse gives us an anxious time. In this book, we will discuss the common causes for such pain and how to deal with the situation when confronted with it.

Heart attack connotes a sudden occurrence. It excludes from consideration congenital, rheumatic and bacterial heart diseases which are so commonly seen from the time of birth till middle age.

Arteriosclerosis

After 50 years there is the onset of old age. It shows itself in greying of hair, wrinkling of face, diminution of libido and general lowering of vitality. The arteries of the body begin to harden and lose their normal elasticity (arteriosclerosis). Later they are felt as hard cords pulsating under the skin. This hardening is particularly common in the blood vessels supplying the heart, the brain and the kidneys.

Atheroma

Hardening of the blood-carrying arteries is aggravated by the deposition of fatty material (Cholesterol compounds) under the lining membrane of their lumen. This is called 'atheroma'. Gradual increase in size of atheroma results in narrowing of the

lumen of the artery. In due course calcium salts become deposited in this fatty material making the affected artery hard and brittle. Such a vessel is not fully competent to supply blood in required volume to the respective organ, particularly when the demand of the organ is for more blood, as during exercise.

Relative Insufficiency

Let us elaborate. Supposing the artery to the leg has become narrow with arteriosclerosis. Enough blood passes through it for resting needs of the individual or even when he walks at a slow pace. But if he walks fast or runs to catch a bus, he may get a shooting pain due to cramp in the calf of the leg, compelling him to stop immediately. He has to wait for a short time for the cramp to pass off, say 5 minutes, and thereafter he is able to resume his walk at a slower pace without pain.

Why did this happen ? The calf muscle did not get adequate oxygen and nourishment for which it depended on the only source, i.e., the blood supplied to it by the concerned artery. The quantity of oxygen which was adequate at rest or for normal walk fell short of the increased requirment of the working muscle on fast walking or running. If adequate supply is not forthcoming, the muscle goes into cramp with excessive painful contraction. This phenomenon is called 'relative insufficiency' because the quantity of blood which was adequate for ordinary needs was insufficient during stress.

Heart and its Nutrition

Heart is practically all muscle. Its only function is to pump blood into the arteries in large quantities and with enough force so as to maintain adequate blood pressure to meet the nutritional needs of all the organs of the body. If the blood pressure is too low, adequate quantity of blood does not reach the organs.

Heart's own nutrition depends on the competence of the arteries which supply this organ with blood. These are two in number and are called 'Coronary arteries' (Fig. 1).

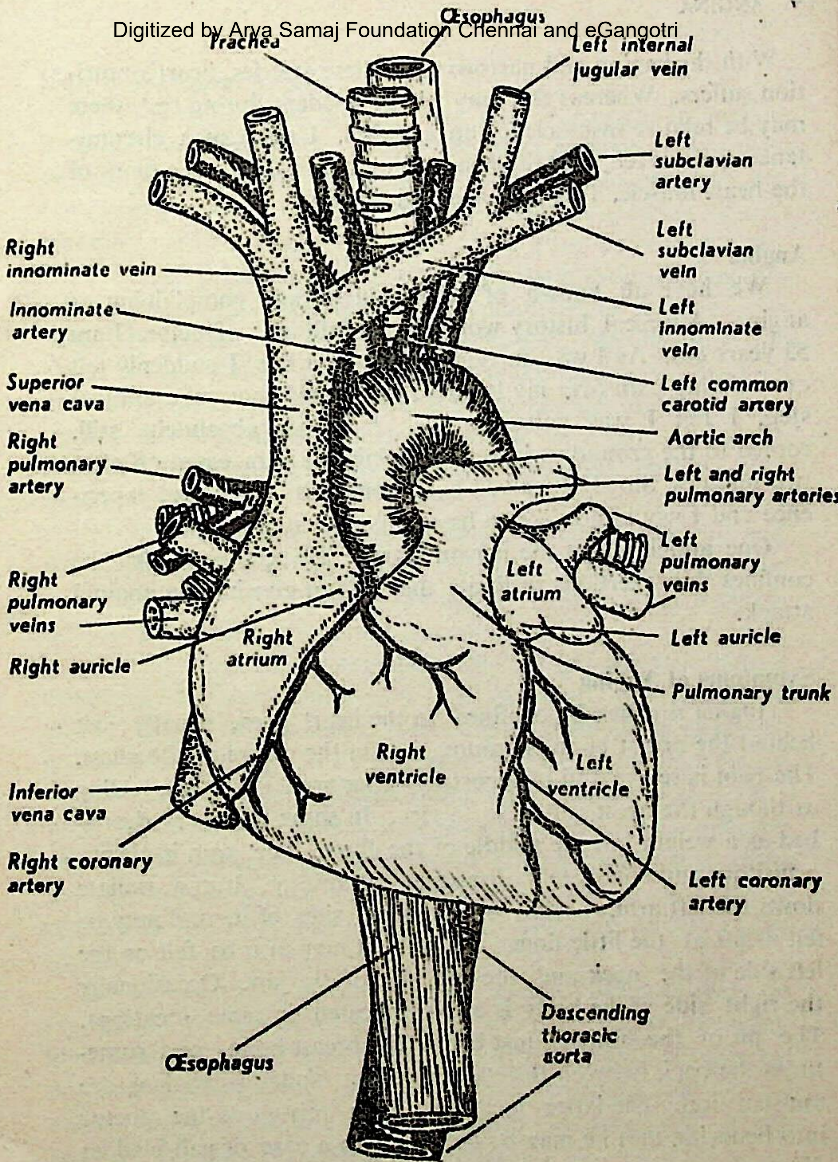


Fig. 1. Front view of the heart showing coronary arteries and large blood vessels.

With thickening and narrowing of these arteries, heart's nutrition suffers. Whereas this may not be evident during rest, there may be relative insufficiency on exertion. Under such circumstances pain is felt over the heart. You may call it a cramp of the heart muscle. This pain is called 'angina'.

Angina

We have all known of some old people complaining of angina. A typical history would be as follows : 'Doctor, I am 53 years old. As I was hurrying to catch a bus I suddenly felt excruciating pain over my heart. I just could not take another step. I felt I was going to die. I stood absolutely still, rooted to the ground as it were. Luckily the pain eased off after two minutes. Slowly I walked back home. It was a bad experience and I would not like to have a similar attack again.'

One attack makes the person scared. He sees to it that he confines his exertions to limits that do not give him an anginal attack.

Symptoms of Angina

Angina is generally confined to the heart area, usually just behind the breast bone (sternum), i.e., in the centre of the chest. The pain is severe and of constrictive nature. There is a feeling as though the chest is held in a vice. In some cases it is described as a weight on the middle of the chest. The pain is always transitory and completely disappears on resting. It may radiate down the left arm, usually on the inner side of it, and may be felt as far as the little finger. In some it may also be felt on the left side of the neck and the left side of the jaw. Occasionally the right side of the body is also implicated in same locations. The pit of the stomach just below the breast bone, and sometimes the back between the two shoulder blades (scapulae) are unusual sites. The latter locations often mis-guide the doctor into believing that he mav be dealing with a case of gall-bladder disease.

How to Recognise Angina

(*a*) The guiding factor is how the pain is caused. In angina it comes on whenever he undertakes extra exertion. In course of time, when the disease has existed for years, the pain may be experienced even at rest, indicating further narrowing of the coronary artery. The pain may come even on excitement. For example, if he is angry, his blood pressure shoots up and he experiences angina. John Hunter, a famous British surgeon, was subject to anginal attacks. He once remarked, 'My life is in the hands of any rascal who chooses to make me angry'. And he died in one of these attacks. But this was perhaps due to supervention of Myocardial Infarction which was not so easily diagnosed in those days. This disease is described later in this book.

(*b*) Anginal pain is always of brief duration. With rest and tranquillisation, it disappears in a couple of minutes. It never lasts more than 10 minutes. During the attack, there is considerable pain and fear of death (angor animi).

(*c*) It is important to recognise whether the pain has indeed arisen in the heart. Such pain will invariably be induced by effort, physical or emotional. Normally no difficulty is experienced on slow walking on a level road. But on any extraordinary exertion such as climbing steps, going up-hill or hurrying against time, an attack of angina may be precipitated. As previously emphasised, such pain dis-appears on resting. The same effort usually reproduces the pain. After being relieved, he is able to resume his walk and may not experience any pain for the rest of the day.

(*d*) Bringing up gas from the stomach, i.e., belching (gaseous eructation), passing of wind from the anus (farting or passing of flatus) and even passing of urine (micturition), may all give relief and often mislead the patient into believing that his real disease is not in the heart. Reproduction of pain with effort, however, confirms the diagnosis of angina.

(*e*) Electrocardiographic examination (ECG) after a brief

exercise may be revealing. It may give very useful evidence of ischaemia, i.e., of deficient blood supply, to the heart muscle. Failure of such evidence, however, does not prove the absence of angina.

(*f*) Transaminase (SGOT) estimation in the blood gives negative valves.

(*g*) Patients often complain of pain close to the left nipple. This pain is seldom connected with affection of the heart. An ache or stabbing pain occurring at the close of day's work is not anginal as it lacks the close relationship to effort.

Causes of Angina

Apart from atheroma, there are other causes which give rise to angina. Incompetence of Aortic valve, narrowing of the mouth of coronary artery due to syphilis, high blood pressure, and anaemia are all known to cause it. Diabetes and hypercholesterolaemia, whether due to rich diet or hereditary factors, are seriously considered by the doctor when confronted with a case. Other rare causes are hyperthyroidism and tachycardia with a pulse rate of over 150 beats per minute.

Food habits

The disease is common among the rich because they indulge in rich food. Atheroma in the arteries takes its root in the years of youth and gradually becomes significant by the time the person attains middle age. It is therefore essential that a person lives on simple diet from childhood so that atheromatous deposits do not take place. Large quantities of fatty and starchy foods are conducive to atheroma. A fat person is more liable to the disease than a thin person and therefore it is desirable to control diet from childhood onwards. Saturated fats are particularly harmful and they mostly come from animal sources. Fatty meats, egg yolk, full cream milk, butter and ghee are all cholesterol productive and therefore conducive to atheroma.

Saturated fats have a higher melting point and are easily identi-

fied because they solidify in winter. Fats which remain liquid in winter, are by and large unsaturated and can be consumed with greater impunity. In this category fall mustard oil, sunflower oil, corn oil, saffola and groundnut oil. Low consumption of these is less likely to be harmful to the arteries. All vegetable oils are not harmless or unsaturated. Cocoanut oil falls in this category.

High Blood Pressure

Worry and tension are also suspected to cause arterial thickening presumably by raising blood pressure. This would aggravate atheroma with tendency to anginal attack. Blood pressure can be kept under control and it is therefore necessary to take expert advice to prevent deterioration of the condition from one's own default.

Tobacco smoking

Tobacco in any form can give rise to spasm, i.e., sudden contraction of the arteries. An already thickened artery with a narrow lumen, if it contracts further even though slightly, would lead to diminished flow of blood through it. If that happens in the case of an anginal patient, he will be liable to more and severer attacks and therefore he must be warned of the consequences. Smokers, particularly those who smoke more than 10 cigarettes a day, may start getting anginal attacks even during rest. They may escape this danger by stopping smoking. It is presumed that the most noxious substance in smoking is the carbon-monoxide. This increases the risk of atheroma development as also of clotting of blood in the arteries.

Diabetes

Diabetes is a potent cause for atherosclerosis. It produces hyper-cholesterolaemia, i.e., increased quantities of cholesterol floating in the blood. Such patients are particularly prone to Ischaemic Heart Disease commonly expressed by the physician as IHD, meaning that the heart muscle is not able to obtain

adequate amount of blood for its requirments. Such patients must come under medical control if adverse effects, such as heart failure, are to be prevented.

Role of Doctor

Drugs are available which decrease the oxygen requirements of the heart. The doctor can advise how to achieve this by lowering the blood pressure, treating diabetes and hppercholesterolaemia as also by preventing spasmodic contraction of the arteries. He can advise on prevention of atheroma and, in most cases, bring down the blood cholesterol level to normal figures. In an actual attack of angina, he can give the much needed reassurance and instructions on how to prevent further attacks and administer such drugs as are suitable for the particular patient.

Referred Pain

Let us proceed a little further. The pain of angina is caused by deprivation of oxygen to the heart. The pain originates in the heart muscle itself. But often the pain is also experienced in the arm, neck, the jaw and upper regions of the stomach. Such pain does not arise in the heart and we call it 'referred pain'.

It is explained as follows. The nerves from the heart have their attachment to the nerve structure, called the spinal cord which is housed in the backbone, the spine. Sensation of pain in the heart is carried by the respective nerves to a particular segment of the spinal cord for the sensation to be further carried to the brain. Because of the excessive pain, the particular segment of the spinal cord becomes hypersensitive. Any other nerves with attachment to the same segment, although not related to the heart, also become over-sensitive and tender. Pain is experienced in structures supplied by such nerves although they supply regions remote from the heart. This is why the pain from the heart muscle is frequently felt in the regions other than over the heart.

Pain in the left Arm

Patients often feel concerned if they have pain in the left arm. They know it is frequently associated with heart disease. They do not know that there are numerous causes for pain in left arm, shoulder and the wrist which are totally unrelated to heart disease. It is therefore incumbent on the patient to seek medical advice and thus make certain that the heart is not the cause of his pain. But if it is, then appropriate treatment must also be taken. One may state in passing that pain felt in the arm at the end of day's work is not caused by heart disease. But if the pain is felt in the course of actual exertion, this needs investigation.

Breathlessness

This symptom is often worrying. It is commonly present when heart failure has supervened, but is not a symptom of early angina. The reason is simple. Considerable effort is needed to cause breathlessness but before that happens anginal pain comes on which prevents further exertion. In any case, if breathlessness is experienced, a doctor should be consulted.

Pulse rate

Anginal pain can occur in tachycardia, i.e., when the pulse is very fast, say over 150 beats per minute. Angina can also occur if the pulse is very slow, say 40 beats per minute or less, and also if the pulse is very irregular. In all such cases, a consultation with a physician is obligatory. In a known case of angina, sudden development of pain, breathlessness, rapid or very slow pulse, or an irregular pulse, they are symptoms heralding the onset of Myocardial Infarction. And same is the case if there is a sudden fall of blood-pressure or feeling of weakness with cold sweats.

Choking Feeling

A sense of choking in an aged person is always worthy of

investigation. No pain may be experienced. Even though investigations prove negative, such patients are usually relieved of symptoms by exhibition of anti-anginal drugs. It may therefore be presumed that the symptoms are anginal, due to coronary narrowing.

CHAPTER II
MYOCARDIAL INFARCTION

Many people are known to die in their sleep and many young people die of sudden heart attack. Although there are many causes for sudden death, here we will confine ourselves to heart deaths alone.

Coronary Thrombosis

A number of years ago, the dead body of a soldier, about 40 years old, was brought to a hospital. Post-mortem revealed a clot of blood blocking a coronary artery. This is technically called Coronary Thrombosis. The clot was over an atheromatous patch in the artery. History was typical.

The battalion was out on manouvres, i.e., practising mock battle. The simulated enemy had taken position on top of the hill. This soldier while climbing, felt a sharp pain in the chest, perhaps a little more severe than in angina. He sat down waiting for the pain to subside. As it did not abate, he thought it was due to hunger. Accordingly he took out a chapatti from his haversack and put a morsel into his mouth. Meanwhile his officer saw him sitting down eating food while the rest of the battalion was engaging the enemy. The officer shouted ordering the soldier to move forward forthwith. The order was duly obeyed but the poor man fell down dead after taking a couple of steps. The morsel of food was found in his mouth at post mortem. No one

was to blame. The officer had ordered him forward in good faith. He did not know that he was ordering a dying man. Later he saw to it that his family got a suitable pension.

Causes of Infarction

This was a typical heart attack occasioned by blocking of supply of blood to a part of the heart due to obstruction in the coronary artery. While angina is caused by restriction of flow of blood and relative insufficiency, myocardial infarction is the result of complete blocking of the coronary with a clot (Coronary thrombosis). Blockage may occur in the following manner:

(*a*) Atheroma in the artery, with calcium deposits therein, becomes hard and brittle. Continuous pulsation of the artery tends to crack the lining membrane of its lumen. This leads to formation of a clot over the broken area.

(*b*) Slight bleeding may take place beneath the atheroma, pushing the atheromatous patch further into the lumen of the artery leading to complete blockage.

(*c*) Atheromatous patch may break away into the lumen of the artery and carried in the blood stream to a narrow part of the artery which it blocks (Atheromatous embolism).

(*d*) Air bubbles sometimes accidentally get lodged in a vein through careless intra-venous injection or due to sucking of air through a wound. Such a bubble may find its way into a coronary artery giving rise to air-locking. This is called Air Embolism.

(*e*) A clot of blood formed in a distant vein—usually a vein in the leg—may break away and get carried to the coronary artery causing blockage (Clot embolism).

(*f*) In a case of fracture, and also during operations on fat people, drops of fat are carried into the blood stream and get lodged in a coronary artery (Fat embolism).

Heart is extremely sensitive to deprivation of oxygen which it can obtain only through the blood supplied to it through the coronary arteries. With artery blockage the part of the heart

supplied by it tends to die. This is Myocardial Infarction. Heart muscle is termed 'myocardium' and 'infarction' means death due to deprivation of blood. The usual cause of myocardial infarction is coronary thrombosis.

Comparison with Angina

Myocardial infarction is a serious event. A person subject to anginal pains for a number of years often dies of myocardial infarction. The latter is only an extension of the former: a narrowed artery of angina becomes occluded causing infarction. The patient gets the pain which is somewhat similar to what he is accustomed to, but now more intense and persistent. Whereas angina occurs only on exertion, infarction usually comes on while resting and often during sleep. The pain in the chest and left arm may be severe and does not disappear with rest. Apprehension makes him restless and he often starts walking about to somehow obtain relief. The pain may last several hours or even days. Fear of death is usually present. His blood pressure may fall and pulse becomes feeble, fast and irregular. Sinking feeling may be prominent often leading to nausea and even vomitting.

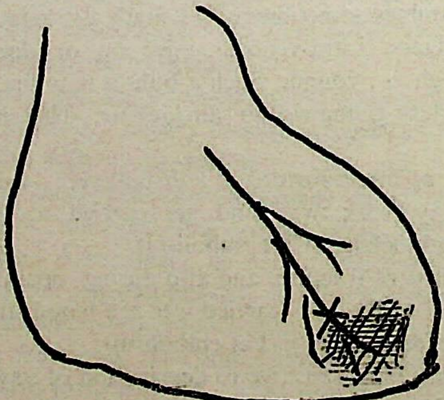


Fig. 2. Showing blockage of a Coronary artery at X with corresponding infarction of heart (shaded area).

His skin becomes cold and beads of sweat may appear on the forehead. There is a little fever also, but this usually appears on the following day. The doctor, when summoned, arranges for an electro-cardiogram (ECG) which may show serial changes of infarction from day-to-day during the first week. Estimation of Prothrombin Time can indicate tendency to further extension of infarction and further likelihood of clot formation. Estimation of serum glutamic oxaloacetic transaminase (SGOT) may indicate with more certainty whether there has been actual death of heart muscle in the presence of doubtful ECG findings. Simpler tests like the WBC count, urine examination for presence of sugar in it, blood sugar estimation and quantitative assessment of serum cholesterol are the usual basic tests ordered by the doctor as helpful in diagnosis and prognosis of a case.

Course of Disease

The first two days following an attack are the most serious. Many die in the first few hours and about 25% are dead during the course of 24 hours of the attack. Upto the 10th day the mortality figures tend to remain high but if the patient lives for 20 days, his chances of recovery become bright. However, it must be stated that it is most difficult to predict recovery in an individual case: often the most serious case survives and it is equally frequent to see an apparently mild case dying of the attack. This only goes to show that at no time should a case be taken too lightly by the family or by the attending physician. The patient must be attended to with a sense of urgency till he is out of the wood. Period of his care is not measured in days but in months and years.

Second and third attacks are not infrequent and each of them is serious. It is therefore essential that medical instructions are faithfully followed because the physician's orders are based on knowledge of extent of damage to the heart muscle, the likely period for its healing, presence of complications, smoking and food habits and also deductions from statistics after due investigations.

Age Consideration

Whereas angina usually occurs after the age of 50, myocardial infarction is common in a much younger man and is particularly common in males. However it is unusual before the age of 30. In older people it is often preceded by anginal attacks for a number of years. In the younger age group, usually there is no previous warning or history of anginal attacks. In all cases the cause is blockage of a coronary artery somewhere in its course.

Severity

While angina is not to be taken lightly, a case of myocardial infarction is ominous for its ability to kill. Before the invention of ECG machines, myocardial infarction was confused with angina. Cases of sudden death were recognised as infarction only at post-mortem. But nowadays a physician is able to recognise the disease from the very start, both from the mode of onset and the result of investigations.

Action called for

At the onset of an attack, absolute rest in bed is mandatory. Everything must be done for the patient and he should not be allowed to get out of bed to do things for himself. A doctor must be summoned and no suggestion should be made to take the patient to the doctor. This is to conserve heart's energy to the maximum extent. Re-assurance, show of sympathy and observance of silence in the room are essential as also giving of encouragement without show of anxiety. No private discussions should be permitted in the sick room at this stage.

Two tablets of aspirin can safely be given unless he prefers crocin, of which one tablet may be enough. If he had previous anginal attacks, a tablet of nitroglycerine or sorbitrate may be chewed and kept in the mouth. However, this is not likely to help and the expected relief from pain will not be forthcoming. Repeating the dose is not recommended as it may prove dangerous by lowering the blood pressure. This should be left to the attending physician for further advice.

No food should be given to him but a cup of tea or glucose water is permissible. After the doctor has seen him, his advice regarding food and permission to leave the bed, even for bathroom activities, should be heeded.

Prognostic factors

The following factors are of adverse prognosis in a case of infarction:

i. Old age.
ii. Obesity, i.e., excessive fat.
iii. Arrhythmia, i.e., irregularity of the pulse. A pulse rate of over 150 beats per minute or below 45, also come under this category.
iv. A blood pressure of less than 80 mm of Hg.
v. Swelling of feet or enlargement of liver.
vi. Presence of diabetes or previously known high blood pressure.
vii. Previous history of infarction.

The following cases have a better chance of recovery:

i. When none of the adverse factors mentioned above are present.
ii. Chances of recovery are more favourable for women until the age of 70. After that age, chances of recovery from an attack are equal for both the sexes.
iii. Chances of recovery improve with each week that passes without onset of complications.

CHAPTER III

PREVENTION AND TREATMENT

Angina

(a) Do only that much exertion as through previous experience you know does not give you a severe chest pain.

It does not mean that you confine yourself to bed. Exercise is beneficial and is the nature's way to open up the coronary arteries to the maximum limit. It also helps to establish collateral circulation which may, in course of time, help to get rid of attacks of pain, or at least diminish their frequency and severity. Above all, it builds up confidence and prevents invalidism.

(*b*) Smoking of tobacco is to be absolutely forbidden. A strong spasm of coronary artery in a previously narrow vessel may convert angina into myocardial infarction with all its attending dangers.

(*c*) Do not hurry to catch a bus etc. If you have to climb stairs, do so at your own pace. Do not get out of breath in the process.

(*d*) Stop at once when pain appears. Simultaneously, chew a tablet of nitroglycerine (or sorbitrate) and keep it in the mouth without swallowing it. It is readily absorbed from the mouth and acts in half a minute. Its absorption into the blood is considerably delayed if it is swallowed. When effective, nitroglycerine gives a feeling of warmth, a slight rise of pulse rate and a little lowering of blood pressure. This drug has proved very beneficial and convenient for averting an attack. It should be carried by the patient in his pocket for urgent use and quickly availed of at the beginning of the least pain in the chest. There is no point in witholding its use. Many patients of angina take half a tablet before they venture out for a walk and find that they do not get an attack at a pace that previously gave them angina. There is no harm in taking 5 or 6 tablets in the course of 24 hours. In fact it may help promote collateral circulation. In order to prevent flushing of face and a fast pulse, the doctor may prescribe you a slow acting drug like peritrate for routine use but this usually is not as efficacious in emergency treatment in an actual attack. It is best used as a preventive of attacks.

(e) One is often asked about the amount of exercise which should be taken. It should not be so intense as to give rise to pain. Otherwise it is all to the good. It tones up the heart muscle and dilates the coronary arteries. It builds up confidence, improves appetite and gives a feeling of good health and fitness.

Relative insufficiency has to be accepted. If a person is over-enthusiastic, he may kill himself because relatively insufficient supply of blood to the heart muscle may be unbearable. It is essential that one hurries slowly. It is advisable to make a start with short and slow walks, say 100 yards on the first day and then gradually to increase the distance and speed to cover 3 miles in one hour. It may take as long as 6 months to do so but all the time there will be a satisfaction of achievement and a feeling of well-being. Due regard must be paid to age when deciding on the distance and speed. He must never hurry. He soon finds out how far and how fast he can conveniently walk without angina. And this is the only criterion that stands out as a guide.

Myocardial infarction

In this case, the doctor's first concern is to ensure complete rest and freedom from pain. The latter he does with pethidine and calmpose. An electrocardiogram is taken and subsequently repeated to assess the extent of damage to the heart as this gives a good idea of the approximate extent of the infarcted area. Oxygen is kept handy and freely used as its exhibition often turns the tide in favour of the patient. In hospital he may be put on a cardiac monitor, a machine which continously shows ECG tracings, indicating to the doctor the rate and character of the heart beats without the use of frequent electrocardiograms or application of stethoscope to the chest. An intravenous drip is set up, using glucose, and it is very useful for prevention of dehydration without loading the stomach with fluids and also for the intravenous exhibition of drugs without frequent pricks to the patient. Blood is taken for estimation of SGOT and this

is repeated on subsequent days. It indicates to the doctor tha the diagnosis is correct even though the ECG findings are inconclusive.

Measurement of blood pressure gives an indication of how the heart is taking the strain. Any irregularity of the heart beat is noticed by the feel of the pulse, by listening to the heart sounds and more accurately by the ECG or cardiac monitor. A white cell count and ESR estimation are helpful in further confirmation of diagnosis. Prothrombin time estimation is essential if the patient has to be considered for exhibition of anti-coagulants.

Hospitalisation

Patients are usually most reluctant to leave their home to go to a hospital. From the account given above, it would be obvious that many of the procedures enumerated would not be possible except in a well-equipped hospital. Larger hospitals are often equipped with special Intensive Coronary Care Units and are thus an obvious choice for the best available treatment. Such attention is not available even in nursing homes, far less in domestic surroundings. In a hospital, it is not essential that a separate room should be made available to you. Treatment in a general ward should not be frowned upon because the facilities in the hospital are still the same and a little inconvenience in a ward should be happily accepted as still superior to anything likely to be available elsewhere. The diagnostic facilities, early recognition of complications and quick remedial measures that are available in a coronary unit can be life-saving and make a difference of life and death in an individual case.

A very fast pulse, irregular beating of the heart, fall of blood pressure to dangerous levels, onset of signs of heart failure are all danger signals which have to be recognised by the attending physician. All these are correctable in favourable surrounding where the doctor is alert, immediately available, has the necessary experience and has full facilities close at hand. Such a situation exists in a large hospital. Bad risk cases are in particular

danger if not handled by an expert. An X-Ray of the heart and lungs gives a good indication of how the heart is taking the strain.

Length of stay in Hospital

The stay in hospital may not be un-necessarily long. If there are no complications, pulse rate is normal and there are no irregular beats, blood pressure is sustained and neither too low nor too high, the patient feels comfortable and not worried, if he stays normal for the first 4 days in a hospital, he can usually be discharged on the 7th day. Very few cases are known to get complications at a later date and they are not worse off than those who choose to stay in hospital for a longer period. But knowing the pathology of the disease and the period required for healing of the dead heart area, it would be necessary to take all precautions that do not give rise to a dangerous consequence.

Invalidism

In a mild case, the patient is allowed to use the commode after a couple of days of bed-rest. In other cases, it would best be left to the attending doctor to guide because he would do so aftea taking all points into consideration. It takes 6 to 8 weeks for an infarcted area to heal and form a scar and the latter is still a weak portion of the heart. The patient is usually allowed to take slow walks under close guidance within a week. There have been cases where the afflicted person defies the doctor and thinks that his lethargy is due to lack of exercise. He undertakes exertion beyond the capacity of his heart often with disasttrous results.

If the pulse is regular, blood pressure is normal and the heart rate is neither too fast nor too slow, there is no evidence of diabetes and serum cholesterol and transaminase are all normal, it is then usual for the doctor to permit slow walks and gradually quicker pace and longer distance. If one remembers that

the heart has suffered a sort of wound which takes time to heal and the scar of which is still fresh and devoid of muscle, that even at rest the heart has to beat continuously and maintain a constant blood pressure, it will be appreciated how careful one must be to avoid getting a hernia in the scar area which may later cause the heart to burst leading to instantaneous death. Such a fear should be entertained only in a case of some severity and happily such are uncommon. Most cases are of a very mild nature and go even unrecognised. This is evident from the fact that many people who die a natural death have often shown scars of infarction in their hearts which were never suspected during their life-time.

One has to be careful but not frightened. Some are over-worried and do not venture out of the house for months and years after a minor attack. They are then dubbed as suffering from cardiac neurosis. The slightest effort gives them a fast pulse, vague pain over the heart and even a fall af blood pressure. All they need is re-assurance by a doctor who must examine them thoroughly to ensure that there is no gross pathology to account for their symptoms. Reassurance from him and graduated exercises usually put them back on their feet. It needs a sound physician to infuse confidence in the patient to increase his exercise tolerance. Once this is gained, there is no looking back.

Collateral Circulation

Frequent mention has been made about collateral circulation. All arteries in the body divide and give off branches to supply their individual territories. This is much like the canal system of irrigation of land. The ultimate branches show tendency to meet the minute territorial branches of the neighbouring artery. This is beneficial because if one branch gets blocked the neighbouring artery comes to its rescue. Thus danger of death of the tissues supplied by the blocked artery is considerably reduced than would have been the case if no help was forthcoming from

the neighbouring vessel. In course of time minute end-vessels dilate and the damaged tissue begins to revive depending upon the extent to which its blood supply is restored. This joining up of the end-vessels and their eventual dilatation is termed development of 'collateral circulation'.

The coronary arteries are not so well-equipped to join up with their neighbours through their minute branches. As the heart must keep beating without rest, the deficiency due to block in its artery is more acutely felt. It does develop collateral circulation but less readily than, say, the skin or the liver. Collateral circulation is encouraged by putting up a bigger demand on blood supply. This encourages the blood vessels to dilate to meet the demand. That is why a patient with angina lives on for years with his coronary arteries narrowed to proportions which would be totally unacceptable to a case of coronary thrombosis. A case of angina had enough time to develop collateral circulation and therefore no infarction or only a small area of infarction is observed when coronary thrombosis has occurred. In case of sudden coronary block without any previous angina, there has been no opportunity for collateral circulation to develop with the result that injury to the heart muscle is immediately grave. However, as time passes, the body makes an all-out effort and with gradual development of collateral circulation, the patient stands a good chance of recovery.

CHAPTER IV

STOKES-ADAMS SYNDROME

Ischaemia means decreased amount of blood supply. IHD includes coronary narrowing (angina) and coronary block (myocardial infarction). There is yet another manifestation of IHD which we call Stokes-Adams Disease or Syndrome.

The Heart Beat

Heart must beat ceaselessly from birth to death. An automatic electric impulse is generated from a particular spot in the upper part of the heart itself at a basic rate of 70 per minute. From here the electric impulse spreads out along a path of a specialised nervous tissue in the heart itself and conduced to all parts of the heart in an orderly manner leading to an orderly contraction.

This nervous tissue is supplied by a small branch of a coronary artery. If this branch gets occluded, the normal transmission of impulse cannot occur. In that case, the heart beats are erratic as the organ reacts only to the few impulses which manage to pass through along the special tissue without obstruction. Those impulses that fail to pass along the normal channel tend to find alternative routes but usually unsuccessfully. The heart beats that follow are abnormal and unpredicted. They can be easily noticed from the pulse or by the use of stethoscope and more specifically by an electrocardiogram.

This is much like the fairy lights one sees twinkling rhythmically in a shop window. If anything goes wrong with the twinkling machine, the twinkling stops or becomes erratic, responding only to the few impulses that manage to get through.

Much the same thing occurs in the case of the heart. If the travelling impulse stops, so does the heart. If the current somehow manages through an alternative route, the response of the heart is not fully effective. It may stop altogether leading to death but usually its rhythm becomes so slow and erratic that it beats only at 10 to 20 beats per minute and leads to loss of consciousness. The person gets no warning signal. With loss of consciousness, his pulse becomes imperceptible and he turns deathly pale. After about 10 seconds a convulsion may occur. His breathing becomes heavy and stertorous. This is a typical STOKES-ADAMS attack. If the heart starts beating again within the next few seconds (upto 1 minute) of such an attack, which is frequently the case, there is regaining of consciousness with

reflushing of the face. The patient remembers nothing. Should the stroke last for more than two minutes, there is no hope of survival.

Artificial Pace-maker

Drugs are available which tend to ward off such an attack but their action is never satisfactory. Now a days such patients are fitted with an electronic device.

It consists of a small battery which throws out impulses much like those arising in the case of twinkling fairy lights. The contraption is surgically implanted in the body of the patient with electrodes touching the heart muscle. The rhythm is pre-set at about 70 beats per minute to which the heart dutifully responds. There are many old people walking about the streets in India doing their normal chores and enjoying the benefits of science through this contraption. Although it gives them complete freedom from attacks, its life is not unlimited. Another minor operation has to be performed for its replacement to give the patient a new lease of life. This has helped out not only the cases of Stokes-Adams but also many who suffer from gross irregularities of heart beat.

Prevention of Ischaemic Heart Disease

In summary, prevention of heart attacks is dependent on prevention of atheroma :

(a) Regulation of food habits from childhood onwards.

(b) Burning up the excessive fats in the body by regular exercise.

(c) Getting the blood examined for possible excess of fatty material (cholesterol and like bodies) present therein.

(d) In case of hereditary hyper-cholesterolaemia by resorting to appropriate diet and exhibition of clofibrate type of drugs as advised by the doctor.

(e) Reduction of weight to normal for height before the age of 50.

(f) Smoking is dangerous, particularly if one is suffering from angina and more so if he had a previous episode of thrombosis. Smokers who suffer from angina are in danger of going into myocardial infarction.

(g) Diabetes, high blood pressure, kidney disease and gout are conducive to heart attacks. A good physician would give the necessary advice.

(h) After any major surgical operation, the leg veins tend to clotting of blood in them. The same happens in prolonged illness involving continuous stay in bed. Clot emboli fly off by breaking away from inside the vein. To prevent clot formation, it is imperative to encourage gentle exercises of the legs which the doctor invariably advises in such cases to improve circulation.

(i) Liability to heart attack increases proportionately to the presence of the above factors. A combination of high blood pressure, obesity, hyper-cholesterolaemia, diabetes and a family history of attacks in parents make one a likely candidate. Tobacco smoking in such a case may well convert the candidate from angina to one of myocardial infarction.

CHAPTER V

DRUGS

There are a large number of drugs which are prescribed in the management of heart attacks. Some of the common ones are detailed below:

1. **Adelphane Esidrex.** A useful drug to control mild hypertension (High blood pressure). Contains Reserpine and a diuretic. Dose one tablet three times a day by mouth.

2. **Aldactide.** Effect is similar to Dytide.

3. **Aldomet.** A very useful drug in cases of hypertension. Given by mouth. 500 to 2000 mg daily in 2 to 4 divided doses.

4. **Aspirin.** Beside relieving pain it is also a mild anti-coagulant, i.e., it hinders ready coagulation of blood. Useful in cases of myocardial infraction and cases of Coronary Insufficiency. By its daily exhibition there is evidence of significant decrease of death rate, or recurrence of infraction. Dose, 3 to 6 tablets per day in divided doses.

5. **Angised.** A very useful drug for control of anginal attacks. Tablet to be allowed to dissolve under the tongue. 0.5 mg tablets.

6. **Atromid S—Lolipid—Lipomid.** Same drug as manufactured by different firms. Effective in reducing circulating lipids (fats and cholesterol) in blood. Given in cases of hypercholesterol aemia. Dose, one capsule 3 time a day by mouth, after meals. Each capsule contains 500 mg of Clofibrate.

7. **Atropine.** This is very useful in cases of myocardial infarction if pulse rate is low accompanied by low blood pressure and premature beats. It raises the pulse rate which usually results in slight rise of blood pressure and elimination of irregularity of heart beats. Dose—Half to one milligram given by injection.

8. **Ciplar—Inderal.** Same drug by different manufacturers. It reduces heart activity and its oxgen requirements by reducing the rate and force of contraction of the heart as also its response to stress and exercise. For these effects the drug is useful in angina, myocardial infarction, high blood pressure and tachycardia. By slowing the heart rate the drug saves it from wasteful expenditure of energy. Dose—10 to 80 mg 3 or 4 times a day. Tablets of 10 mg and 40 mg are available. Also given by injection,

It must not be given to patients with history or symptoms of asthma.

9. **Coumadin Sodium—Synthrom.** An anti-coagulant. Given by mouth. 20 to 40 mg to induce. Maintenance 5 mg daily.

This is a dangerous drug and must be used under strict medical supervision with frequent Prothrombin Time control.

Its careless use may give rise to bleeding into the skin and internal organs. There are several drugs which adversely affect its action, sometimes dangerously so for the patient. Counteracted by Vit K.

10. **Digoxin—Lanoxin.** Same drug. Causes more forceful contraction of the heart. Seldom used in myocardial infarction unless there is evidence of supervening heart failure with shock. It is a very effective drug but must be used under strict medical control because of its potentialities to cause dangerous complications, such as production of premature heart beats and even death. Dose—0.25 mg tablets by mouth 1 to 3 times a day. Also given intra-venously—0.5 mg.

11. **Dilantin.** Used as a prophylactic or for the treatment of premature heart beats, whether occurring spontaneously in myocardial infarction or following digoxin (digitalis) treatment. Often effective when Pronestyl has failed. Contraindicated if heart-block is present, or if the pulse is very slow.

12. **Dytide.** A very useful diuretic which causes extra secretion of urine, is slow but effective, specially when the patient is not showing adequate response to Lasix or Hythalton. Effect starts after 2 hours. Maximum in 6 hours. Given in 2 doses, 1 to 2 tablets after breakfast and 1-2 tablets after lunch. No potassium supplement is essential with this.

13. **Heparin.** A quick-acting anti-coagulant. Given as intravenous injection. Useful in myocardial infarction and thrombo-embolic conditions, such as pulmonary embolism to reduce tendency to re-infarction during the first post-infarction month and to prevent coagulation of blood in the leg veins, etc. 5000 to 15000 units given intravenously.

14. **Hythalton.** Present name for Hygroton. This is a diuretic. It causes excretion of abundant quantity of urine, thus decreasing the circulating blood volume and thus relieving heart effort. It is advisable to give potassium along with hythalton. Dose—50 mg daily. Or 100 mg on alternate days.

15. **Hythalton R.** This contains a diuretic and Reserpine.

Relieves congestion of tissues by removing excessive fluids through the kidneys. Reserpine has a soothing effect. Used when there is raised blood pressure.

Dose—One tablet every morning.

16. **Hydromet.** A drug often used to lower blood pressure. Dose 2 to 8 tablets per day.

17. **Inderal.** See item 8 (Ciplar).

18. **Insulin.** No longer used as routine. At one time it was injected along with potassium and glucose in all cases of myocardial infarction till its usefulness was doubted. With glucose it is still sometimes advocated in cases with hyperpotassaemia.

19. **K salt.** Often advocated for administration with diuretics and salt restriction. This particular salt has a reasonably good taste without much sodium in it.

20. **Keylyte.** Used as potassium-containing fluid. See Potklor.

21. **Lanoxin.** See Digoxin. Another name for the drug.

22. **Lasix.** A very effective diuretic, extensively used to promote urine excretion to decrease lung congestion in cases of myocardial infarction. 40 mg tablet taken early in the morning.

It should be given along with extra potassium which needs replenishment.

23. **Lingocaine.** It is local anaesthetic. In cases of heart attacks it is used intravenously to reduce cardiac irritability which is the usual cause of arrhythmia—irregular beats of the heart. Has been a life-saving drug in myocardial infarction both in the prevention and treatment of immature beats.

Dose—50 to 100 mg as a 1% solution intravenously given over 2 minutes. Also in intravenous drip as a continuous transfusion till premature beats are contained.

24. **Lolipid—Lipomid.** Both are clofibrate. See Atromid.

25. **Mephentin.** Used to raise blood pressure. Tablets of 10 mg taken twice a day. Not to be given after 4 p.m. as it leads to wakefulness.

26. **Nephril and Nephril R.** Much like Hythalton and Hythalton R.

27. **Nitroglycerine.** This is the drug contained in Angised.

28. **Peritrate.** Long-acting vaso-dilator used in angina.

Dose—10 mg tablets taken twice a day.

29. **Pethidine.** This is used to allay pain and cause sleep. The pain—relieving action lasts for 2-4 hours. Intramuscular injection is more reliable and takes effect in 10 to 15 minutes. It is usual to give the drug only for a couple of days as it is habit—forming and causes a sense of euphoria, i.e., a feeling of pleasure. It is difficult to break the habit once formed.

Dose—50 to 100 mg by mouth. 100 mg intramuscularly.

30. **Potklor—Keylyte—Kesol.** All these patent names contain potassium for administration in cases where excessive urine is caused to be excreted with diuretics. Usually given on the days when a diuretic is used.

One teaspoonful to be taken in a tumblerful of water after meals.

31. **Pronestyl.** Used in cases where premature beats are troublesome. Action similar to Lignocaine.

1-2 tablets twice a day.

32. **Persantin.** For long term prophylactic treatment of coronary thrombosis. A mild anti-coagulant.

25 mg tablets and 100 mg tablets obtainable.

Dose—50 mg to be taken before meals 3 times a day.

33. **Sorbitrate.** Action much like Angised. Used similarly.

34. **Sinthrom.** An anticoagulant. See Coumadin Sodium.

श्रीमती सुलखनी देवी महाजन ट्रस्ट

इस ट्रस्ट की स्थापना जुलाई 1968 में डा० विद्याधर महाजन, एडवोकेट ने अपनी पूज्य माता की पुण्य स्मृति में की। इस ट्रस्ट ने जनता की भलाई के लिए निम्नलिखित पुस्तकें मुफ्त बांटने के लिए छापी हैं और जिन सज्जनों को ये पुस्तकें चाहियें वे लिख कर मंगवा सकते हैं :—

1. सन्ध्या तथा हवन मन्त्र।
2. वैदिक सन्ध्या।
3. देश-भक्ति के गीत।
4. ईश्वर-भक्ति के गीत।
5. मनुष्य स्वस्थ कैसे रह सकता है ? (कविराज हरदयाल वैद्यवाचस्पति)
6. दैनिक रोगों की सरल चिकित्सा (कविराज हरदयाल वैद्यवाचस्पति)
7. रोगी परिचर्या (कविराज हरदयाल वैद्यवाचस्पति)
8. दैनिक योग आसन (महाशय विशनदास)
9. आदर्श जीवन कथायें, भाग I, भाग II (विमला मेहता)
10. दांतों की सुरक्षा (डा० एम० एल० वाटस)
11. राजस्थान का गौरव (चन्द्रमोहन बुद्धिराजा)
12. माँ (गायत्री मन्त्र की व्याख्या) (महात्मा आनन्द स्वामी)
13. Instructions for Diabetics by All India Institute of Medical Sciences, New Delhi (in English and Hindi).
14. Care of the Teeth by Dr. M.L. Watts (in English).
15. Care of Your Eyes by Dr. M.S. Aggarwal (in English).
16. Understanding Your Children by Dr. Satish C. Verma (in English).

17. Preserving Unity of India by Chief Justice ... Chand Mahajan.
18. Accession of Kashmir to India by Chief ... Mehr Chand Mahajan.
19. How to Increase Food Production in India by Chief Justice Mehr Chand Mahajan.
20. Democracy in India and its Future by Sri Prakasa, (in English).
21. The Making of a Good Citizen by Sri Prakasa (in English).
22. Fi... Crossing by Dr. S.C. Kashyap (in English).
23. Adult Suffrage by S.P. Sen-Verma (in English).
24. Secularism by Mr. Justice J.M. Shelat.
25. This Neurotic Age of Ours by Prof. R.S. Gill.
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32. Heart Attack by Dr. B.N. Bhandari.
33. He Can who thinks he can (J.S. Bright).
34. Husband-Wife Relations (Dr. S.C. Varma).
35. Domestic Roots of India's Foreign Policy (Dr. A. Appadorai).